

## Exam Review

### About the exam

- Time & Place: Dec. 14<sup>th</sup>, 9 AM, ARTS
- Go to the ARTS building, see instructions for where to go next
- **BRING YOUR MCGILL ID!!!**
- 3 hour exam
- No Calculators allowed
  - no audio/video device
  - no cell phone (bring watch)



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### More about the exam

- Format: 8 questions on 8 “different” topics, with subquestions
- Similar in style to midterm
- *Budget your time: look at how much a question is worth. This value is proportional to the amount that you need to write down (usually)*
- *Answer the question asked. On midterm, partial grade was given for answers to a “related” question. This will no longer be the case. If you fail to answer the question asked you will not get points. Of course, you will get partial grade for partially answering the correct question.*

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### Not on the exam

- Motivation
- History of Computation
- Social aspects of computing (lectures 20, 21)
- Historical background, scientist names, dates
- Halting Problem from last class
- DARPA grand challenge
- Chatterbots

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## Topics: Data Representation

- Number Systems
  - what this means
  - binary to decimal conversion, decimal to binary
  - understanding octal, hexadecimal
  - binary arithmetic (like homework)
- Text
  - ASCII, how to read this file
- How many different values can be represented using  $n$  symbols of the set  $\{0, 1\}$ ,  $\{0, 1, \dots, 9\}$ , etc. ?

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## Hardware

- Go over Fetch-Execute Cycle notes & midterm solution (study the graphics)
- Storage
  - HD, RAM, Cache
  - ROM
  - Kinds of secondary storage
- Buses, ports
- Video card, sound card, network card
- Motherboard

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## Data Compression

- Lempel-Ziv
- Triangle compression (check solutions to HW1)
- Audio/image compression
- Huffman codes

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## Audio/Image File Formats

- Image
  - digital representation from analog data
  - how colours are stored
  - resolution, colour depth
  - compression: .gif, blurring, .jpeg
- Audio
  - digital representation from analog data
  - sampling rate, sampling precision
  - .wav, .mp3 file formats

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## Networking

- Network protocols (don't need to memorize keywords of each protocol)
- Layered communication
- TCP vs. UDP
- Network performance measures
- Peer-to-Peer lecture:
  - know difference between Client Server and P2P
  - don't worry about the precise details of pipes
  - don't worry about "JXTA pictures"

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## Networking

- How IP addresses work
- Function of gateways/routers
- Internet:
  - DNS, DNS lookup process
  - HTTP, HTML (what is it?)
  - Don't need to memorize HTML tags
  - What is the WWW
  - Static vs. Dynamic Web pages
- Email:
  - SMTP, POP3, MX records (what are these?)
  - MIME

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## Programming in JavaScript

- Variable names
- Declaration, assignment
- Arithmetic, comparison and logical operations
- Conditional, loop constructs
- Strings, string manipulations
- Functions
  - write your own: return, parameters
  - prompt, parseInt, alert, confirm
- Don't need to know: generating random numbers

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## Algorithms

- Algorithmic "complexity"
  - comparing algorithms in terms of the number of "primitive operations" they do in the worst case
- Sorting/searching
  - insertion sort
  - sequential and binary search
- Graphs
  - Euler tour/Euler path
  - Paving a town with smallest cost roads, so that all intersections are reached
  - Traveling salesman problem: visit all the cities/intersections, never come back to the same one and return home

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## Algorithms

- Trees (binary trees)
- Huffman codes
  - Use information about the frequency of occurrence of characters to come up with short encodings
  - If no such information is available, what would you do?
- Computational Geometry
  - point-in-polygon problem
  - ray intersection and winding number algorithms

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## Artificial Intelligence

- What are the goals?
  - one goal: design rational agents that make autonomous, intelligent decisions
- Planning problems:
  - define states (vertices), transitions (edges), costs of edges; formulate as *graph search*
  - build a tree from a graph (vertices may repeat)
  - depth first search, breadth first search, uniform cost search with or without goal

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## Artificial Intelligence

- Classification
  - nearest neighbour classification
  - $k$ -nearest neighbour classification
  - speeding up the search:
    - kd-trees
    - know how to build one
- Game Theory
  - choosing the optimal strategy (looking at the situation by considering what the other person might do and considering how you should respond in each case)

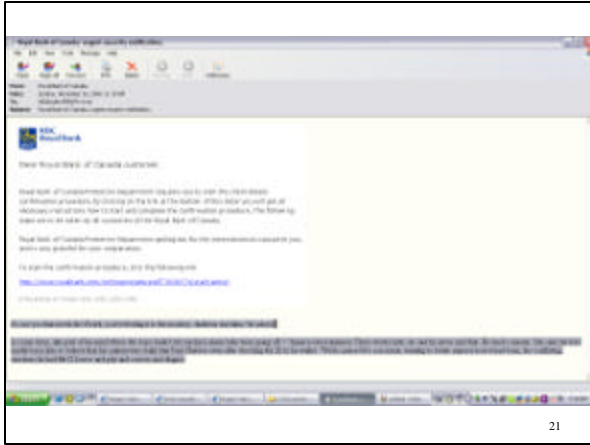
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## Artificial Intelligence

- Turing test
- What other suggestions for testing machine “intelligence” (versus human)
- Nothing else

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Don't need to know for exam!

## Guessing Game

Need to know for exam!

```
var rand = Math.random() // gives a random number between 0 and 1
var num = Math.round(rand*100) // num is an integer between 0 and 100
var max_guesses = 10 // maximum number of guesses allowed
var num_guesses = 0
var win = false
while (num_guesses < max_guesses && !win)
{
  var guess = prompt("Pick a number between 0 and 100", "")
  guess = parseInt(guess)
  if (guess > num) { alert(guess + " is too high!") }
  else if (guess < num) { alert(guess + " is too low!") }
  else if (guess == num) { win = true }
  num_guesses = num_guesses+1
}
if (win) { document.writeln("You win! :)") }
else { document.writeln("You lose :(") }
```